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ABSTRACT

Optimal-level theories maintain that the quality of affect is a function of a quantitative arousal potential dimension. An alternative view is that the quantitative dimension merely modulates preexisting qualitative properties and is therefore only responsible for changes in the degree of affect. Thus, the quality of affect, whether it is positive or negative, has to be treated as an independent variable. In an experiment to compare these alternatives, the quantitative dimension was measured by varying the degree of unexpectedness of endings in stories that were overall either positive or negative. Contrary to predictions of optimal-level theory, the results showed that differently valanced story endings, judged the same on an expectation scale, were rated very differently in hedonic tone and preference by high school readers. (Author)

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CENTER FOR THE STUDY OF READING

Technical Report No. 293

QUANTITATIVE AND QUALITATIVE SOURCES OF AFFECT: HOW UNEXPECTEDNESS AND VALENCE RELATE TO PLEASANTNESS AND PREFERENCE

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Abstract

Optimal-level theories maintain that the quality of affect is a function of a quantitative arousal potential dimension. An alternative view is that the quantitative dimension merely modulates pre-existing qualitative properties and is therefore only responsible for changes in the degree of affect. Thus, the quality of affect, whether it is positive or negative, has to be treated as a separate independent variable. In an experiment to compare these alternatives, the quantitative dimension was manipulated by varying the degree of unexpectedness of endings in stories that were overall either positive or negative. Contrary to predictions of optimal-level theory, results showed that differently valenced story endings, judged the same on an expectation scale, were rated very differently in hedonic tone and preference.

Quantitative and Qualitative Sources of Affect: How Unexpectedness and Valence Relate to Pleasantness and Preference

In 1874, Wundt proposed the classic inverted-U curve to link stimulus intensity and hedonic states. According to Wundt, stimulus intensity up to a moderate level is increasingly pleasant and beyond this optimal-level stimuli become increasingly less pleasant up to some indifference baseline, from which point unpleasantness increases with increments in stimulus intensity. As a major theoretical construct, the optimal-level curve stimulated a great deal of research, especially during the 1950's when the hypothesis underwent an important revision (McClelland, Atkinson, Clark, & Lowell, 1953; Haber, 1958). According to the revised version, affect is "a function, not of increasing physical intensity per se, but of the size of the discrepancy between the adaptation level (adaptation or expectation) of the organism, and the stimulus (perception)" (Haber, 1958, pp. 370). Subsequent major developments in optimal-level theory were primarily due to Berlyne (e.g., 1960, 1973, 1974a) who reintroduced the original Wundt curve, replacing intensity with arousal potential, i.e., arousal-inducing properties of external stimulation. Berlyne defined arousal potential to include not only intensity or discrepancy from expectation but other "collative" variables such as complexity, incongruity, conflict. and uncertainty.

The basic assumption underlying the optimal-level hypothesis is that the origin of the quality of affect, be it positive or negative, lies in the quantitative dimension (the quantity of arousal potential, the size of the

discrepancy from expectation, etc.). A clear statement of the quantitative origin of the quality of affect may be seen in the following quotation from Haber (1958):

> McClelland, Atkinson, Clark, and Lowell (1953) have developed a theory based, in part, on Hebb's (1949) neurological model of the origin of affect and Helson's (1947) notion of adaptation level. According to McClelland's discrepancy hypothesis as to the origins of affect, 'positive affect is the result of smaller discrepancies of a sensory or perceptual event from the adaptation level of the organism; negative affect is the result of larger discrepancies' (McClelland, et al., 1953, p. 43). (Haber, 1958, p. 370, italics added)

More recent statements of optimal level theory do not explicitly claim that the quantitative dimension is the sole source of the quality of affect, but they do suggest that it causes affective quality. For instance, Berlyne (1974b) stated that "positive hedonic values can come about in either of two ways, namely through a moderate increase in arousal (the 'arousal-boost mechanism') or through a decrease in arousal when arousal has reached an uncomfortably high level (the 'arousal-reduction mechanism')" (p. 8). Furthermore, even in the more recent optimal-level literature, researchers treat the quantitative dimension as if it were the only source of affective quality (i.e., valence of hedonic tone); certainly, they never explore any other sources.

While it is reasonable to assume that the quantitative dimension modulates intensity (cf., Gati & Tversky, 1982), the proposal that it determines quality is more troublesome. It can be argued that quality is fundamentally distinct from quantity (e.g., Gati & Tversky, 1982; Iran-Nejad, 1980; Iran-Nejad & Ortony, 1982; Stevens, 1957). In the context of affect, the qualitative/quantitative distinction is central, most notably, to the two-factor theory of emotion proposed by Schachter and Singer (1962).

In examining the qualitative/quantitative view of the origin of affect, this paper attempts to deal with the problem of testability often raised in connection with the optimal-level theory. The problem arises from the difficulty of determining a priori where on the abscissa of the inverted-U curve the optimal level (or point) is located. Arkes and Garske (1977), for instance, state the problem as follows: "If an optimal level of a subject is known, and the complexities of the various stimuli presented to the subject span a range above and below the optimum, then an inverted-U must be found in order to support the theory. However, most optimal-level research does not specify an individual's optimal level a priori" (p. 164). Consequently, empirical results showing linear rather than curvilinear properties can always be explained away as representing sampling of the independent variable on only one side of the optimal-level. Thus, Arkes and Garske have concluded that "an inverted-U relation allows so many possible curves that the theory is difficult to refute." In view of the amount of research that the inverted-U hypothesis has generated and continues to generate (e.g., Carrol, Zuckerman, & Vogel, 1982; Eysenck, 1967; Greenberg & O'Donnell, 1972; Karmel & Maisel, 1975; Zillmann, 1980), the conclusion that the theory may be irrefutable and therefore "worthless" (Arkes & Garske, p. 164) is a disturbing one. However, we believe that it would be wrong to draw such a conclusion. One clear prediction that optimal-level theory makes is that a given degree of arousal potential cannot give rise to both positive and negative affect. This may be contrasted with the hypothesis of independence of quality from quantity, and the corollary hypothesis that it is the qualitative variable that is the direct source (cause) of affect. On this view, under different qualitative conditions, a given degree of arousal potential can be positive or negative. In contrast to the notion of arousal potential, which signifies, in part, the quantitative dimension, we refer to the qualitative

variable as valence potential: The potential that a stimulus has for influencing valence-specific biofunctional characteristics of the organism.

Two lines of research may be construed as having already produced results contradicting the purely quantitative inverted-U hypothesis. One line of research generally cited as counter-evidence (see Walker, 1981) has involved the use of gustatory stimuli (e.g., Engle, 1928; Pfaffman, 1960, 1969). Certain stimuli (e.g., quinine) fail to result in pleasantness at any concentration (Pfaffman, 1960, 1969) and others (e.g., sugar) seem either to be pleasant regardless of their intensity (Engle, 1928), or become unpleasant only after post-ingestion factors intervene (see, e.g., Pfaffman, 1960). Walker (1981), however, has argued that optimal-level theory can survive such findings. He reasoned that gustatory/sensory data might deviate from the inverted-U curve because they merely reflect peripheral activity and concluded that curves such as those resulting from Engle's data might "be brought together to form an inverted-U if they were plotted against neural intensity . . . measured at an appropriate central site rather than in the sensory nerve" (p. 42-43).

The other line of research, though not commonly discussed in connection with the inverted-U hypothesis, originated in the work of Schachter and Singer (1962). Their theory of emotion suggests a separation of the kind of affect from the quantity of arousal. However, neither the original Schachter and Singer (1962) experiment, nor studies adopting a similar attribution of arousal approach (e.g., White, Fishbein, & Rutstein, 1981) have unequivocally demonstrated that the same degree of arousal can be both positive or negative--a demonstration that we believe to be necessary if the inverted-U hypothesis is to be definitively refuted. The typical attribution of arousal paradigm involves "(a) the experimental manipulation of a state of physiological arousal, (b) the

manipulation of the extent to which the subject has an appropriate or proper explanation of his bodily state, and (c) the creation of situations from which explanatory cognitions may be derived" (Schachter & Singer, 1962, p. 382). An optimal-level theorist can argue that the latter two manipulations, rather than exerting their influence on the quality of affect in terms of cognitive labeling operations, do so in terms of their own arousal-inducing properties. For example, in the Schachter and Singer experiment, apart from the intended direct manipulation of arousal through injection, other aspects of the experiment may have produced additional arousal. Epinephrine-ignorant subjects, lacking a proper explanation for their arousal symptoms, may have been additionally aroused as a result of subjective uncertainty. Epinepherine-misinformed subjects may have been aroused not only because of subjective uncertainty or injection but also because of the discrepancy between the symptoms they were expecting and those they actually experienced. Furthermore, the affect-inducing situation itself may have given rise to additional arousal, perhaps more so for the anger than the euphoria condition as the Schachter and Singer data seem to indicate.

Similar problems arise in interpreting other experiments in this tradition. For instance, White, Fishbein, & Rutstein (1981) had male subjects participate in an exercise (the arousal manipulation) either for 15 seconds (Low Arousal, LA) or for 120 seconds (High Arousal, HA). The subjects then watched a videotape of a female confederate who was made to appear either highly attractive (High Attraction, HAT) or unattractive (Low Attraction, LAT). Subjective measures of attraction indicated that HA-HAT subjects liked the confederate more than LA-HAT subjects, and HA-LAT subjects liked her less than LA-LAT subjects. The scores for LA-HAT, HA-HAT, LA-LAT, and HA-LAT conditions

would constitute an inverted-U curve if they were arranged in that order. An inverted-U interpretation of the data would only require the assumption that the negative attraction condition caused more arousal than the positive attraction condition.

It is perhaps because of such considerations that optimal-level theory has continued to exert an influence on research in spite of evidence that appears to be inconsistent with it. The inverted-U hypothesis is employed in such diverse domains as infant perceptual development (e.g., Greenberg & O'Donnell, 1972; Karmel & Maisel, 1975), aesthetics (e.g., Berlyne, 1971, 1974a), environmental psychology (e.g., Mehrabian & Russell, 1974), media entertainment (e.g., Zillmann, 1980), and prose comprehension and appreciation (e.g., Brewer & Lichtenstein, 1981; Kintsch, 1980; Moynihan & Mehrabian, 1981).

Although the valence potential hypothesis and the attribution of arousal theory both maintain that the quality of affect is distinct from the level of arousal, they are markedly different in other respects. Our approach, which is based on a biofunctional model of cognition (Iran-Nejad & Ortony, 1982), has, for present purposes, three important characteristics. First, it claims that the intensity factor exerts its influence on already-existing quality, rather than quality somehow emerging from cognitive evaluations that label or explain already-existing arousal. With respect to the empirical framework, this assumption means that the initial valence potential of the stimulus must be taken into account. For instance, if Schachter and Singer had had an independent group of subjects rate the behavior of the confederate on a dichotomous negative/positive scale, they would presumably have observed that the situational cues in the anger condition were initially negative and that those in the euphoria condition were initially positive, quite independently of

attribution of arousal operations. A second characteristic of our view is that cognition does not generate affective quality--valence is independent of meaning, and valence potential properties of the stimulus are independent of their meaning potential. This implies that cognition influences the quality and intensity of affect not directly but in terms of valence potential properties of the stimulus which, presumably, exert their influence through certain affect-specific areas of the brain. This notion assumes that the experience of affect can, in principle, occur in the absence of cognitive content, as has been proposed by Zajonc (1980), in the same way that (cold) cognition can occur in the absence of affect. Empirically, this means that the quality of affect has to be considered as a separate categorical variable, distinct not only from physiological arousal or other quantitative factors, but also from cognitive evaluation. Finally, the biofunctional theory implies that the intensity of affect factor must be distinguished from the intensity of arousal dimension. This contention is supported by evidence that cognition can directly intensify the experience of affect without the mediation of autonomic arousal (Iran-Nejad, 1983).

The quantitative factor manipulated in the present experiment is the level of unexpectedness. It must be noted, however, that there exists no evidence that unexpectedness (or any other collative variable) exerts its quantitative influence in terms of autonomic arousal even though many optimal-level theorists assume that it does. Rather, we, like they, examined the (quantitative) influence of unexpectedness per se on the experience of affect. Since most optimal-level studies do not involve direct measures of autonomic arousal, the use of unexpectedness as a quantitative variable is entirely fair.

Our qualitative variable, the valence potential of the stimulus, must be distinguished from hedonic tone. Hedonic tone refers to the experience of degrees of pleasantness or unpleasantness, while valence potential refers to stimulus properties that influence the sign of that experience. Hedonic tone, therefore, is a combination of both the qualitative and quantitative aspects of affective functioning. It is a continuous variable resulting from the interaction between two independent dimensions, or causes. Obviously, when valence potential is realized as affective experience, it always and only manifests itself in some quantity, that is, in terms of degrees of affective experience. In this sense, quality of affect and its intensity are independent in much the same way that, by analogy, the essential nature of a substance (e.g., sugar) is independent of (i.e., cannot arise from) the weight dimension. Increasing the amount of such a substance from one arbitrary quantity to another results only in more of the same. It does not and cannot change the substance to a different substance (e.g., sugar to salt).

The use of valence potential as an independent variable raises the problem of whether it should be treated as a dichotomous or trichotomous variable. Although the phenomenological experience of affect can be positive, negative, or neutral, one cannot assume that valence potential has the same tripartite structure. In fact, we propose that valence potential has no neutral level. Since this is a crucial assumption, the following extended analogy will be used to clarify it: Imagine an object able to move forwards or backwards along a straight line. The object can be in one of three states. It can be moving forwards, it can be moving backwards, or it can be stationary. Velocity, which is a continuous variable, is a function of direction and speed. Speed is the quantitative dimension, and direction is the qualitative dimension. Non-zero

velocities arise from the contribution of non-zero speeds to one of the two levels of direction. The special case of zero velocity arises not from the contribution of speed to some third level of direction (i.e., "no direction"), but simply from zero speed. Thus, it makes no sense to talk of degrees of "stationariness." Notice, however, that extremely low speeds may result in a moving object seeming to be stationary (one cannot see the hour hand moving on a clock face). But, this is a fundamentally different sense of the word "stationary" from the genuine absence of velocity (and direction).

So too with affect: An organism can be in one of three experiential states. It can be in a positive, negative, or neutral state. Hedonic tone, which is a continuous variable, is a function of valence potential and a quantitative factor. Non-zero levels of hedonic tone arise from the contribution of non-zero levels of the quantitative dimension to one of two levels of valence potential. The special case of zero hedonic tone arises not from the contribution of the quantitative dimension to some third level of valence potential (i.e., no valence), but simply from a zero level on the quantitative dimension. Thus, while positive and negative hedonic tone can vary in degree, it makes no sense to talk of degrees of neutrality. Notice, however, that extremely low levels on the quantitative dimension may result in a valenced stimulus seeming to be neutral. But, this is a fundamentally different sense of the word "neutrality" from the genuine absence of hedonic tone (and valence potential).

If valence potential is indeed only a two-valued variable, it follows that attempts to determine the valence of some particular stimulus (i.e., the qualitative component of the resulting hedonic tone) must avoid mistaking <u>apparent</u> neutrality (i.e., imperceptibly low levels of hedonic tone) for <u>genuine</u>

neutrality (i.e., the absence of valence potential). Things that are minutely positive or negative are, nevertheless, positive or negative.

So far we have been using the term affect as if it were synonymous with hedonic tone. Optimal-level theorists rarely distinguish between hedonic tone and, for example, preference: "the term 'hedonic tone' embraces . . . degree of pleasure, preference, or utility" (Berlyne, 1974b). However, there is no a priori reason to equate hedonic tone and preference. Indeed, there is some evidence suggesting that they are distinct psychological dimensions (see, Moynihan & Mehrabian, 1981). It seems entirely possible that a person could judge two objects as being equally pleasant while still preferring one over the other, perhaps because of additional (cognitive) qualitative factors (e.g., interestingness).

The present experiment attempted to test the predictions of optimal level theory and contrast them with those of the valence potential hypothesis. This was done by manipulating the level of unexpectedness and the valence potential of the critical conclusion information in story endings. Subjects read stories and then made hedonic tone and preference ratings. Optimal-level theory would seem to make the following predictions: (a) the quality of hedonic tone (i.e., positive or negative) should be a direct result of the unexpectedness of the critical conclusion information in story endings, and thus identical degrees of unexpectedness should result in hedonic states of the same quality (pleasant or unpleasant), and (b) identical levels of unexpectedness should result in identical degrees of preference. In addition, (c) unexpectedness should make no significant contribution to preference beyond its contribution via hedonic tone (because hedonic tone and preference are not distinguished). In contrast, the predictions of the valence potential hypothesis are: (a) the quality of hedonic

tone should be independent of the expectation manipulation (because initial valence potential is the only source of affective quality), and thus identical levels of unexpectedness can result in either pleasant or unpleasant hedonic states depending on the initial valence potential of the critical conclusion information; and (b) identical levels of unexpectedness can result in different degrees of preference, again depending on the valence potential of the critical conclusion information. Furthermore, since hedonic tone and preference are assumed to be psychologically distinct, (c) there could be a contribution of unexpectedness to preference after its effects through hedonic tone have been partialed out.

Method

Subjects

Sixty high school students (grades 11 and 12) participated in the main experiment. The majority of the subjects were female but the two sexes were approximately evenly divided among the experimental conditions.

Design and Materials

Design. A 2 x 2 randomized factorial design was used with two levels of expectation (expected vs unexpected) and two level of valence potential (positive vs negative). Both factors were between-subjects.

The passages. The four passages were revised versions of a story by Thurmond (1978). Each version consisted of a stem and an ending. Altogether, there were four stems and two endings. The basic story was about a nurse, Marilyn, who left the hospital where she worked after a late night shift. As she was driving home, she noticed that she was running out of gas. This frightened her, especially because there had been a recent surge in muggings and

beatings in the area. She decided to go to a gas station run by a person called Gabriel, with whom she was slightly acquainted having been to his station for gas before. He fills up the car and tells her that he has recently received an unusually nice birthday gift. He insists that she go inside his office to see it. She finds herself in an awkward situation and reluctantly accepts the invitation. The stem ends as she follows him inside.

Unexpectedness was manipulated by withholding information from the stems (of the unexpected versions) or by signaling it in the stems (for the expected versions) in otherwise identical story versions. Note that, as it is, the basic stem implies that Marilyn is perhaps going to be raped/mugged and that Gabriel is perhaps a rapist/mugger. The column labeled "Critical Ending Information" in Table 1 shows the gist of the conclusion information for negative and positive

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Insert Table 1 About Here

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story versions. In the ending for negative valence potential conditions, it turns out that Marilyn is not raped/mugged and that Gabriel is not a wolf in sheep's clothing. Rather, the police discover heroin in Marilyn's car and arrest her. Thus, the critical conclusion information for this ending is that Marilyn is a drug dealer, and that Gabriel is an informer instrumental in her arrest. Overall, this information was assumed to have negative valence potential. In the ending for the positive valence potential conditions, again Marilyn is not raped/mugged. Furthermore, Gabriel, who apparently suspected that "someone" was hiding in the back of Marilyn's car calls the police. They come, but find no rapist/mugger in the car. Instead they find the dog of the hospital parking lot attendant. Thus, the critical conclusion information for

this ending is that a (friendly) dog emerges from Marilyn's car, that she is safe, and that Gabriel is a Good Samaritan. This information was assumed to have overall positive valence potential.

The column marked "Critical Stem Information" shows the main thematic additions to the basic stem, as well as other important stem information, for each of the four conditions. The expected and unexpected story versions were constructed so as to be semantically similar as much as possible, especially with respect to the overall story content at the moment the subjects finish reading the story and begin their affective ratings. The main difference between the stem for the unexpected negative version and the basic stem was that the former contained a sentence indicating that while driving home Marilyn noticed a police car behind her. It also contained information suggesting that there might be something suspicious about Gabriel: "Marilyn discounted the few disturbing rumors that accompanied his sudden appearance in the area." This stem, therefore, implied that Gabriel was a wolf in sheep's clothing and possibily a rapist/mugger and that Marilyn was perhaps going to be raped/mugged.

The stem for the expected negative story contained additional information indicating that Marilyn was somehow involved with drugs, although the nature of this involvement (e.g., as a pusher, in connection with her job as a nurse, or even as an FBI undercover agent) was not clear. For example, the stem stated that while driving "she looked forward to a long soak in the tub . . . [and] while she soaked she planned to skim through a new magazine and forget about her involvement in the drug business." Thus, like the unexpected negative one, this stem implied that Gabriel might be a rapist/mugger and that Marilyn was in danger of being raped/mugged. However, this stem also implied that Marilyn was probably a drug dealer. and that Gabriel was perhaps a police informer.

The unexpected positive version was constructed by adding information to the basic stem implying that someone might be hiding in Marilyn's car--"she thought she heard someone breathing behind her." Information was also inserted suggesting that Gabriel probably saw someone hiding in the car and invited her inside in an attempt to get her out of danger. Therfore, in this stem, while Marilyn was again likely to be raped/mugged, Gabriel was not portrayed as a rapist/mugger. Rather, the stem implied that he was perhaps a Good Samartan intending to save Marilyn from getting raped/mugged by a maniac probably hiding in the back of her car.

The expected positive stem contained information additional to that in the unexpected positive stem--information compatible with the possibility that the dog of the hospital parking lot attendant was in the back of her car. In a brief dialog the attendant tells Marilyn that his dog is lost, that when it gets bored "he goes and sleeps in the back of my car," and that "he isn't there now." However, again, even though this version was designated as "expected," the possibility that there was a person in the back of Marilyn's car always remained. This ending implied that Marilyn was again in danger of getting raped/mugged, if not by someone hiding in the car but by a rapist/mugger running loose in the area. Gabriel was perhaps again going to be a Good Samaritan.

As, described earlier, two endings were associated with these four stems, one for the negative pair and one for the positive pair. The ending for the negative conditions begins with Gabriel turning quickly around and locking the door. He pulls a gun and tells Marilyn that there is no birthday present. At this point, approaching squad cars are heard and the gas station is soon filled with flashing lights. Police officers search Marilyn's car, and find three bags of heroin. They come in, handcuff her and take her away. As she sits in the

police car, she regrets having trusted Gabriel.

In the ending for the positive conditions, Gabriel locks the door, gets a gun, and calls the police. They arrive and Marilyn and Gabriel go to the window to watch. It is clear now that both are safe. Then, when the police open the car door, "a large dog stepped out, obviously confused by the flashing lights and sirens" and Marilyn realizes that it belongs to the security guard of the hospital parking lot.

Story characteristics. The two story endings were constructed a priori such that the critical conclusion information for the negative story versions has negative valence potential and that for the positive story versions is positive. It must be noted, however, that it is not a forgone conclusion that the endings are as they were intended to be in terms of valence potential. For instance, there are at least two reasons why the negative ending might in fact be rated as positive. First, in this ending, a guilty drug dealer, Marilyn, gets her just deserts (i.e., gets arrested). Secondly, contrary to what was implied by the negative stems, Marilyn is not raped/mugged. One might think that what happened to Marilyn (i.e., the arrest) was not quite as bad as what was expected to happen (i.e., rape/mugging). In order to confirm that the valence potential of the critical conclusion information of the negative versions was negative, and of the positive versions was positive, the materials were normed. Since affective judgments were to be made after reading the entire story, steps were taken to avoid a potential confounding in norming the stories. While reading a story, a reader may experience a sequence of alternating affective states. For the purposes of the present experiment, the critical state is the last one, the one that follows the expectation manipulation and determines affective judgments of the subjects. We felt that

the valence of this state could be assumed to be determined only by the valence potential of the critical conclusion information, and the intensity of this state could be assumed to be determined by the degree of unexpectedness of the critical conclusion information. In order to take account of this consideration, the norming task had to distinguish between the valence potential of the mental state that was assumed to be the basis of the (final) affective judgements and that of all other (prior) mental states subjects might have experienced. In other words, although the valence potential of the critical conclusion information had to be determined in the context of the rest of the story, if subjects read a story and are then asked whether it is positive or negative, their response might be based not just on the last affective state that they experienced, but on some summary judgment of the sequence of the earlier states. To reduce the chance of this potential contamination, two synopses were constructed, one for the positive and one for the negative versions. These synopses were constructed so as to match as closely as possible the representations of the semantic content of the stories that subjects would presumably have immediately after reading them. The following is the synopsis for the positive versions:

> Marilyn, a nurse, leaves the hospital where she works after a late night shift. A dog belonging to the hospital parking lot attendant is sleeping in the back seat of her car. She knows the dog but she does not know that it is in the car. As she is driving, she notices that she is low on gas. She decides to go to a gas station whose attendant she knows. While cleaning the back windows, the attendant sees something. He thinks someone is probably hiding in the back of her car and gets her out by inviting her to go inside his office "to see the nice birthday gift my sister gave me." Once inside, he calls the police. When the police come, they find the dog. Marilyn notices that it is the dog of the hospital parking lot attendant.

Eight adult judges rated the conclusion of this synopsis (i.e., the way it ended); seven of them rated it as positive on a dichotomous (positive vs

negative) scale. Eight different judges rated the conclusion of the synopsis for the negative versions and all of them rated it as negative.

The dependent measures. Each subject in the main experiment read the stem and then stopped briefly to respond to two preending rating scales. Each scale ranged from 1 (strongly disagree) to 10 (strongly agree). One of the scales, the preending preference scale, asked subjects to indicate their degree of agreement with the statement: "I would like to see this story end in an unexpected way, that is, in a way very different from the way the story makes me think it will end." The second scale asked the subject to rate the degree to which "I would like to stop here and not read the ending." On the next page, subjects were actually given the choice of reading the ending or recalling the story. Subjects not choosing this option, and none did, turned the page and read the ending. They were then immediately asked to rate the ending on a pleasantness scale ranging from 1 (extremely unpleasant) to 10 (extremely pleasant), and on an expectation scale ranging from 1 (extremely unexpected) to 10 (extremely expected).

In addition, there were five postending preference scales. The first scale measured the degree of agreement of the subject with the statement, "I would like to read again a story with an ending of the same type (meaning expected or unexpected) as the one I just read." We will refer to this as the direct postending preference scale, because it asked subjects to rate their preference for the type of ending they had just directly experienced. The remaining preference scales were indirect in that they asked subjects to rate their preferences for types of story endings they had not actually encountered. There were four such scales. The first (Scale 1) measured the degree to which the subject "would like to read a passage with an unexpected ending if the ending is

pleasant." Scales 2, 3, and 4 repeated the same statement, replacing the words unexpected/pleasant with expected/pleasant, expected/unpleasant, and unexpected/unpleasant respectively.

Procedure

Each subject received a booklet containing the instructions, the passage, and the rating scales. The instructions told the subject that the experiment was concerned with memory for what people like to read as opposed to memory for what they do not like to read. They were told that they would read two passages, that they would be asked to recall only the second passage, and that the purpose of the first passage was to determine the type of passage people like to read. Subjects then read the stem, responded to the preending rating scales, read the ending, and responded to the postending rating scales. The response booklets were then collected and subjects received a second booklet containing memory instructions and a short passage. The memory protocols for this passage were later discarded since their only function was to complete the "cover story."

Results

Preending Ratings

Responses to the two preending questions were quite uniform. Most subjects indicated that they would like to see the story end in an unexpected way regardless of the condition they were in (overall mean = 7.18, SD = 2.44). This finding is, incidentally, inconsistent with the claim that unexpectedness per se is aversive (see, e.g., Aronson, 1968). Similarly, subjects strongly disagreed that they wanted to stop before reading the ending (overall mean = 1.34), and none of them chose to do so.

Postending Ratings

Unexpectedness ratings. The mean expectation ratings are presented in the first column of Table 2. Evidently, the expectation manipulation was successful. A two-way analysis of variance on expectation scores showed a

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Insert Table 2 About Here

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significant effect for level of expectation; $F(1, 56) = 21.52$, $p < .01$. The main effect for valence approached significance, $F(1, 56) = 3.72$, $p = .06$; negative versions tended to be rated as less expected than positive versions. There was no significant interaction between valence and expectation, ($F < 1$). Dunn's multiple comparison tests resulted in significant differences between the two positive (expected vs unexpected) and the two negative conditions, $p < .01$ and $p < .05$ respectively. The mean expectation ratings for the two unexpected endings were not significantly different, the difference in ratings being a mere 0.73, suggesting that subjects regarded the unexpected endings as being equally unexpected. This finding is particularly important in the present context because the critical hypotheses to be tested concerning the relation between affect and expectation require that the level of expectation be the same for the two unexpected endings. The two expected conditions were not significantly different either, although the magnitude of the difference was somewhat larger (1.74).

Pleasantness ratings. The mean pleasantness ratings are also shown in Table 2. The two expected endings were both rated as neutral (means: 4.93 and 5.13 for the positive and negative versions, respectively), supporting the contention that at lower levels of the quantitative dimension (unexpectedness),

valenced objects can appear to be neutral. The ratings for the two unexpected endings (which represent high levels of the quantitative dimension) were significantly different (means: 7.60 and 3.53 for the positive and the negative versions, respectively). Thus, contrary to the predictions of the inverted-U hypothesis, hedonic tone (i.e., pleasantness) increased with increments in unexpectedness for positive stories, but decreased for negative ones. A two-way analysis of variance on pleasantness ratings resulted in a valence x expectation interaction $F(1, 56) = 23.89$, $p < .01$. This interaction is illustrated in Figure 1. Consistent with the valence potential hypothesis, the same degree of

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Insert Figure 1 About Here

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unexpectedness resulted in pleasantness or unpleasantness depending on the valence potential. As anticipated, there was also a significant main effect for valence; $F(1, 56) = 19.62$, $p < .01$. There was no significant main effect for expectation; $F(1, 56) = 1.49$; p = n.s. Multiple comparison tests pairing the two positive (expected versus unexpected), the two negative, and the two unexpected versions all reached significance at .01, .05, and .01 levels, respectively.

Preference Ratings. In order to examine the hypothesis that the same degree of unexpectedness would result in different degrees of preference, depending on the valence potential, a 2 x 2 analysis of variance was carried out on the direct postending preference scores. The main effect for valence, and the valence x expectation interaction barely missed significance, $F(1, 56) = 3.77$ for both, $p = .06$. However, the crucial difference, namely that between the means for the two unexpected endings, was significant using Dunn's

procedure, $p < .05$. Figure 2 shows that, as predicted, the same degree of

Insert Figure 2 About Here

unexpectedness resulted in different degrees of preference. For the positive story, high unexpectedness resulted in high preference, but for the negative story it resulted in relatively low preference, supporting the view that unexpectedness influences preference through valence potential. Comparison of preending with postending preference data for the two unexpected endings also produced results consistent with this interpretation. As illustrated in Figure 3, subjects in the positive unexpected condition expressed a strong preference (mean = 8.13) for an unexpected ending prior to actually reading such

Insert Figure 3 About Here

an ending and their level of preference for such an ending remained high (mean = 8.07) after reading one. However, subjects in the negative unexpected condition, while also expressing a high preference (mean = 7.20) for an unexpected ending prior to reading one, showed a significant drop in preference ratings for such an ending after actually reading one (mean = 5.33).

Another hypothesis was that unexpectedness influences preference independently of its effects through hedonic tone. This hypothesis received some support from the fact that the partial correlation between unexpectedness and preference scores, controlling for pleasantness scores (i.e., hedonic tone), was significant, $r = .30$, $p < .05$.

Direct Versus Indirect Preference Scales

It is always possible that subjects in this experiment experienced no affect at all, but responded to the rating scales on the basis of abstract, "cold" judgments. For example, their ratings might merely have been based on some sort of affect-free "inference rules" such as "unexpected things are usually interesting, and therefore, preferable." The indirect postending preference scales were included to address this issue. The direct postending scale asked subjects about their preference for a passage with an ending of the same type as the one they had just experienced, at a time when, presumably, the affective state they were in was a result of reading the story. Thus, this scale attempted to measure the influence of direct (concrete, raw) affect on subjects' preference. On the other hand, the four indirect scales required subjects to rate their preference for different types of story endings in abstracto. So these scales were more likely to reflect abstract, affect-free judgments. Therefore, higher preference ratings on the direct than on the indirect postending scales might serve to increase one's confidence that the direct scales were indeed measuring experienced affect. It should be noted that this depends on the conservative assumption that ratings on the indirect scales were not influenced by affective reactions to the passage.

Insert Table 3 About Here

Table 3 shows the mean ratings for these scales. While there were 4 indirect scales, one corresponding to each condition, only one of them was comparable to the direct preference scale that a subject encountered in his or her condition. For instance, in the unexpected positive condition, the direct

preference scale measured subjects preference for a passage with an unexpected pleasant ending. Therefore, for this condition, ratings on the direct scale (mean: 8.07) are comparable only to those on the indirect Scale 1 (mean: 6.67), that is, to the scale that asked subjects to rate their preference for a passage with an unexpected pleasant ending. The corresponding pairs of means (direct versus indirect) are underlined in Table 3. The overall mean for the direct preference scale (6.32) was significantly higher than the overall mean of the four comparable (i.e., underlined) indirect scales (5.02), $\underline{t}(59) = 2.58$, $p < .05$. The overall mean for the direct preference scale is also comparable to a combination of the overall means of the four indirect scales (i.e., the mean of the values in the "total" row of Table 3). This contrast (6.32 vs 5.05) was also significant at .05 level. For both tests, the magnitude of direct preference scores was larger than that of indirect scores, suggesting that affective ratings were more pronounced when they were not based on what may have been relatively abstract ("cold") judgments.

Discussion

The critical finding with respect to the inverted-U hypothesis is that the two unexpected endings, while not rated as significantly different in terms of unexpectedness, produced hedonic tone ratings that were not qualitatively identical, as predicted by the optimal-level theory, but that were diametrically opposed to one another. Thus, it appears that unexpectedness of the critical conclusion information intensified affect in terms of the valence potential of this information. Rather than directly causing quality, quantity manifested itself in terms of quality.

As far as the preference results are concerned, subjects in the two expected conditions did not differ in their preference ratings. However, again,

those reading the unexpected endings diverged in their preference ratings. Unexpected pleasant endings were rated as preferable to unexpected unpleasant endings. Thus, unexpectedness seems to influence preference, not directly, but in terms of hedonic tone. However, hedonic tone alone failed to explain the relationship between unexpectedness and preference ratings. There was a significant correlation between unexpectedness and preference ratings after the contribution of unexpectedness through hedonic tone had been partialed out. Similar findings have also been reported by Moynihan (1980), for instance, who found evidence that pleasure and preference are indeed different dimensions.

There are a number of ways in which one might attempt to explain these results in terms of optimal-level theory. It might be argued that other qualitative differences (apart from valence potential) between the positive and the negative stories interacted with unexpectedness causing the stories in which the dog was in the back of Marilyn's car (the story for the positive conditions) to generate an inverted-U curve quite different from that generated by the stories in which Marilyn was a drug dealer (the story for the negative conditions). Optimal-level theory might thus attempt to accommodate the interaction illustrated in Figure 1 by postulating the two curves shown in Figure 4. Point E in Figure 4 might correspond to the degree of unexpectedness for the two expected versions and point U would correspond to the degree of unexpectedness for the two unexpected versions. In this fashion, it might be argued, the two identical degrees of unexpectedness could result in qualitatively opposite hedonic states, not because of any differences in valence potential but because of other differences between the two stories that would cause different patterns of interaction between unexpectedness and affect.

Insert Figure 4 About Here

There are, however, problems with this kind of explanation. First, there is no a priori reason why the positive and negative stories should generate curves as dramatically different as those illustrated in Figure 4, especially when the curve corresponding to the negative stories (curve N) has to be associated with lower degrees of unexpectedness. Secondly, even if the two stories did result in different curves, one would still have to explain how the negative stories could be manipulated to obtain the degree of pleasantness required for the optimal-level in curve N. In general, this line of argument, while logically possible, is psychologically uninterpretable; we think the results are more readily explained in terms of qualitative differences in valence potential rather than in terms of other qualitative differences between the stories.

Instead of trying to accommodate the results in terms of other qualitative differences, an optimal-level theorist might argue that the positive and negative versions differed with respect to other uncontrolled quantitative factors. For instance, while the negative ending was as unexpected as the positive ending, it was perhaps more complex. Two types of evidence would counter such an argument. First, the positive and negative stories did not differ in content complexity. Complexity ratings of the synopses collected from ten adult judges revealed that the mean ratings on a 7-point scale (1 = simple, 7 = complex) were 4.6 and 4.2 for the positive and negative versions, respectively. These values were not significantly different. Secondly, if the stories were to be different with respect to other collative variables, one

would expect such differences to be reflected in the affective ratings of the two expected versions. Since expected stories did not differ in hedonic tone and preference ratings, it is reasonable to assume that the differences between the expected and the unexpected stories were only due to the degree of unexpectedness.

Yet another possibility, although not very plausible, is that unexpectedness exerted its influence through tension or arousal reduction. It is possible that the stems for the two unexpected conditions caused more uncertainty and, therefore, more tension. This tension might have been temporarily heightened by the unexpectedness of the ending and then reduced when the surprise was resolved. Optimal-level theorists claim that tension/arousal reduction can result in positive affect. Zillmann (1980) has argued convincingly that positive affect cannot be explained merely in terms of relief from tension. As far as the present results are concerned, even if the tension-reduction hypothesis wer to explain the increment in pleasantness for the positive unexpected condition, it could not explain the increment in unpleasantness for the negative story.

It seems then, that the only remaining course of action for the optimal-level theorist would be to restrict the scope of applicability of the theory to only "neutral stimuli" (see Russell & Mehrabian, 1978). In this case, valenced stimuli would constitute a separate source of affective quality. However, in the past, optimal level theorists have not opted for this solution in the face of embarrassing data from studies using clearly valenced stimuli such as sugar or quinine (see, e.g., Walker, 1981). Secondly, the distinction between neutral and valenced is not always clear-cut. As we argued earlier, valenced stimuli may seem neutral at lower levels of the quantitative dimension. If one were to

judge the valence of the stimuli used in the present experiment merely on the basis of pleasantness and preference scores for the two expected conditions, our stories would seem quite neutral. Finally, and perhaps most seriously, from the perspective of optimal-level theory such a move would concede too much. It would be tantamount to abandoning the theory as a general account of the origin of affect.

Many psychologists, including optimal-level researchers, realize that there are problems with the inverted-U hypothesis, but they continue to use it presumably because it has never been definitively refuted, and because there has been no alternative as broad in scope. The alternatives that there are (including the attribution of arousal approach) tend to be tied to specific domains. It is our contention that the present findings constitute an unequivocal demonstration of the failure of optimal-level theory to explain the origin of affect. We also believe that the valence potential hypothesis carries the promise of a genuine alternative. However, although the present findings are consistent with this hypothesis and were predicted by it, they do not provide unequivocal support for it. The present experiment tested the valence potential hypothesis against the inverted-U hypothesis, but not against other alternatives. Thus, for example, the results might be explicable in terms of the attribution of arousal theory, although we find this alternative somewhat less plausible and more restricted in scope than the account we present. An attribution of arousal account appears to require two assumptions. First, it must be assumed that unexpectedness exerts its quantitative influence by causing excitatory reactions that increment autonomic arousal. Second, it must be assumed that, lacking an explanation for their experienced arousal, subjects initiate an epistemic search for its cause (cf., Zillmann, 1978). The first

assumption seems plausible; but there is some evidence (Iran-Nejad, 1983) that unexpectedness can exert its quantitative influence on the experience of affect by intensifying intellectual activity in the absence of autonomic arousal. In a study similar to the present one, cognitive factors such as interestingness did not correlate at all with perceived autonomic arousal (r = .07, ns.), but correlated highly with surprisingness (r = .43, $p < .001$) and, most importantly, with the intensity of affect (r = .40, $p < .001$). We are thus reluctant to assume that subjects' affective ratings in the present experiment resulted from cognitive evaluation of unexplained arousal increments caused by unexpectedness.

The second assumption seems untenable as far as the present experiment is concerned. First, even if subjects did experience unexpectedness-induced arousal, it is difficult to see why, having initiated a search for the cause of their arousal, they would not opt for the most obvious explanation, namely, "I am surprised and that is why I am aroused." If they did, they would be likely to rate the two unexpected endings similarly. But it might be possible to argue that subjects initiated some sort of a deeper search for clues, in terms of the critical conclusion information or the story as a whole. It might be argued, for instance, that subjects reading the negative unexpected ending determined that what happened to their favorite character was "bad" and used this appraisal judgment to label their arousal. However, data collected from judges who rated the synopses indicated that what happened to Marilyn was judged to be moral, just, legal, and logical. In spite of this, subjects in the main experiment did not like it. Discrepancies of this sort between cognitive and affective judgments, though not rare in everyday experience, are difficult to account for given only the assumption that the quality of affect arises from arousal-labeling cognitive operations.

Another way of explaining the data would be to argue that the affective ratings in this experiment were merely the result of story-specific characteristics. For example, perhaps subjects enjoyed the positive ending because it contained information that favorably resolved potentially life-threatening problems facing a liked protagonist. This interpretation, though conceivable, does not seem to apply to our results. As Table 1 shows, by the time subjects encounter the critical conclusion information, Marilyn is already in the safety of a locked office. But even if one were to accept the unlikely possibility that subjects were still under the influence of the thought, in the back of their minds, that Marilyn was in danger early in the story, it would still not be clear why this should be explained in story-specific terms. A story-independent explanation would be that it is the resolution of life-threatening problems per se that is positive because, for instance, it activates in the reader (observer, etc.) ideas related to safety and security that have positive valence potential. So long as there is nothing in the ending to interfere with these ideas, it does not matter who the safe and secure individual happens to be. Thus, even if the story-specific proposal could explain why the positive ending was rated as positive (as opposed to merely not negative), the story-independent account would be preferable because of its generality.

With respect to the unexpected negative condition, a story-specific account might propose that the unexpected negative ending was disliked because it contained information that solved the perceived problems facing the liked protagonist in a manner unfavorable to her. The ending was unpleasant not because it contained an arrest but because it involved the arrest of a liked protagonist. The expected negative ending would be rated as neutral because

subjects in that condition inferred early on that Marilyn was a drug dealer and thus had little sympathy for her. According to this interpretation, the expected negative ending, while rated as neutral, must have actually been positive, not negative, because in it a bad story character, Marilyn, receives her just deserts. The valence potential hypothesis, on the other hand, suggests that arrests are threatening and therefore intrinsically negative. Thus, the neutralness of the expected negative ending was only apparent neutrality (of something actually negative). As a result, when the ending became unexpected the initial negativity was intensified and resulted in unpleasantness. Again we prefer the valence potential hypothesis. First, given the "just deserts" interpretation, it is not clear why the judges reading the negative synopsis unanimously rated the critical conclusion information as negative on a dichotomous scale even though they knew that Marilyn was a drug pusher and that was why she was arrested. Any theory attempting to explain story affect in terms of sympathy or empathy with story characters must explain why people can both dislike bad things and like good things when they happen to bad individuals. Perhaps some "things" (e.g., murder, rape, injustice) have negative valence potential regardless of whether the victims are liked or disliked just as others (e.g., security, love, compassion) are positive regardless of whether the beneficiaries are good or bad.

In general, story-specific accounts tend to be only descriptive. One still needs to explain why certain story-specific characteristics (e.g., the degree to which a reader empathizes with a protagonist) cause differences in affective valence. Perhaps the valence potential alternative can serve as an initial step towards such a goal as well as towards explaining those instances of story affect that cannot be adequately clarified in terms of story-specific

properties. For instance, Iran-Nejad (1983) found evidence suggesting that subjects' affective ratings were not particularly influenced when critical conclusion information clearly resolved protagonists' problems. Affective ratings were much more affected by the degree to which the conclusion provided a coherent ending to the story, again suggesting that what is important is the valence potential of the information.

An obvious problem with the present experiment is that it employed only one set of stimulus materials, leaving open the possibility that the observed effects, although consistent with the valence potential hypothesis, are actually artifacts due to a confounding of valence potential and story content. We have already argued in our discussion of Figure 4 that such an explanation cannot save the inverted-U hypothesis. However, the fact remains that the positive and negative stories did differ in content and that this difference corresponded to the difference in valence. It is, of course, impossible to manipulate valence without some change in content, a fact that is reflected in such studies as those reported in Berlyne (1974c) and Schachter and Singer (1962). Berlyne used black-and-white reproductions of two pictures having totally different content, Raeburn's Portrait of a man and Rubens' Massacre of the innocents. Schachter and Singer used two completely different emotion-inducing enactments, one designed to induce euphoria and the other designed to induce anger. The tests of the theories that were provided by these experiments were not considered inappropriate because of the use of stimuli having different contents. Perhaps this is because there is no theory of the influence of "raw" content on affective ratings except when that content is somehow mediated by other factors (e.g., collative variables in Berlyne's case). In our experiment, the positive and negative stimuli seem to have been more similar in content than has

traditionally been the case. Nevertheless, it would be comforting to know that the findings are replicable with different materials. More recent work that we have conducted suggests that this is in fact the case. In the course of investigating a related, but different issue (Iran-Nejad, 1983), data similar to those in the present experiment were collected. Two basic stories were used in a somewhat different design using a slightly different procedure. In both cases the equivalent data revealed the same pattern as those reported here.

The main purpose of this paper has been to demonstrate that optimal-level theory cannot account for the origin of affect. In general, our claim, based on our findings and other evidence (see, e.g., Reisenzein, 1983), is that no explanation of the origin of affect can be based on either arousal itself, or cognitive labeling of perceived arousal. As an alternative, we proposed the valence potential hypothesis. This, while acknowledging that cognition can influence affect and that affect can influence cognition, locates the origin of affect in the influence of determinable valence potential properties of the stimulus. Valence potential affects affect-specific organismic mechanisms distinct from those responsible for "cold" cognition. It is thus independent not only of quantitative stimulus properties--activity potential (i.e., arousal or intellectual activity)--but also of other qualitative stimulus properties such as meaning potential in the same way that the auditory properties of a stimulus are qualitatively distinct from its visual properties. While the data we have presented disconfirm the optimal-level account of the origin of affect, and while they cannot be readily accommodated by attribution of arousal theories, they are compatible with the predictions of the valence potential hypothesis.

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Table 1

Expectation and Valence Potential Manipulations

as a Function of the Critical Stem and Ending Information[a]

Condition	Critical Stem Information	Critical Ending Information
Negative		
Unexpected	A police car is behind Marilyn. Marilyn is perhaps going to be raped/mugged. Gabriel is probably a wolf in sheep's clothing.	Marilyn is <u>not</u> raped/mugged. Gabriel is <u>not</u> a wolf in sheep's clothing.
Expected	A police car is behind Marilyn. Marilyn is perhaps going to be raped/mugged. Gabriel is probably a wolf in sheep's clothing. Marilyn is perhaps a drug dealer. Gabriel is probably a police informer. Marilyn is perhaps going to be arrested.	Police discover heroin in Marilyn's car. Marilyn is a drug dealer. Gabriel is a police informer. Marilyn, a guilty person, is arrested.
Positive		
Unexpected	Marilyn is probably going to be raped/mugged. A rapist/mugger is in the area and could be in Marilyn's car. Gabriel is probably a Good Samaritan.	Marilyn is <u>not</u> raped/mugged. No rapist/mugger is in the car. Attendant's friendly dog emerges from the car.
Expected	Marilyn is probably going to be raped/mugged. A rapist/mugger is in the area and could be in Marilyn's car. Gabriel is probably a Good Samaritan. Hospital attendant has lost his (friendly) dog. Dog often sleeps in attendant's car. Attendant's dog may be hiding in Marilyn's car.	Marilyn was never in danger. Gabriel thought a rapist/mugger was in the car. Gabriel acted to save Marilyn. Gabriel is a Good Samaritan. Marilyn, a good person, is safe and secure.

[a]The information in this table does not necessarily represent information explicitly stated in the text. Rather, it represents the gist of the most relevant, i.e., critical, information.

Table 2

Mean Expectation and Pleasantness Ratings by Condition

Condition	Expectation Ratings		Pleasantness Ratings	
	Mean	S.D.	Mean	S.D.
Expected Positive	6.07	3.56	4.93	2.05
Expected Negative	4.33	2.87	5.13	1.55
Unexpected Positive	2.60	1.45	7.60	1.81
Unexpected Negative	1.87	1.25	3.53	1.25

Table 3

Mean Ratings for Direct and Indirect

Postending Preference Scales

Condition	Preference Ratings				
	Direct Scale	Indirect Scale 1	Indirect Scale 2	Indirect Scale 3	Indirect Scale 4
Expected Positive	4.93	7.13	4.33	4.07	4.67
Expected Negative	5.93	5.80	4.67	4.00	6.07
Unexpected Positive	8.07	6.67	3.80	4.00	4.07
Unexpected Negative	5.33	6.93	5.40	4.07	5.07
Total	6.32	6.63	4.55	4.03	4.97

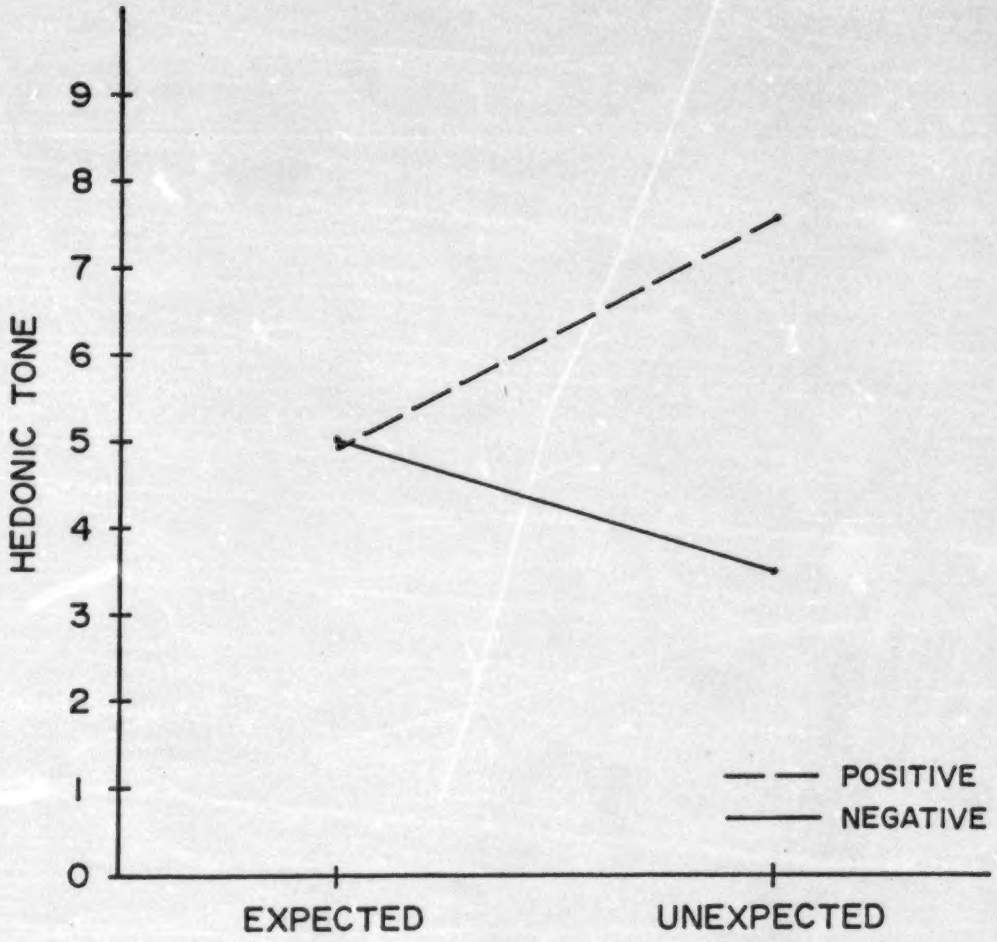
Figure Captions

Figure 1. Mean hedonic tone ratings for positive and negative story endings as a function of level of expectation.

Figure 2. Mean preference ratings for positive and negative story endings as a function of level of expectation.

Figure 3. Mean preference ratings for the two unexpected story endings as a function of time of judgment.

Figure 4. Hypothetical relationship between unexpectedness and hedonic tone resulting in separate curves for the negative (Curve N) and positive (curve P) story versions.


HEDONIC TONE
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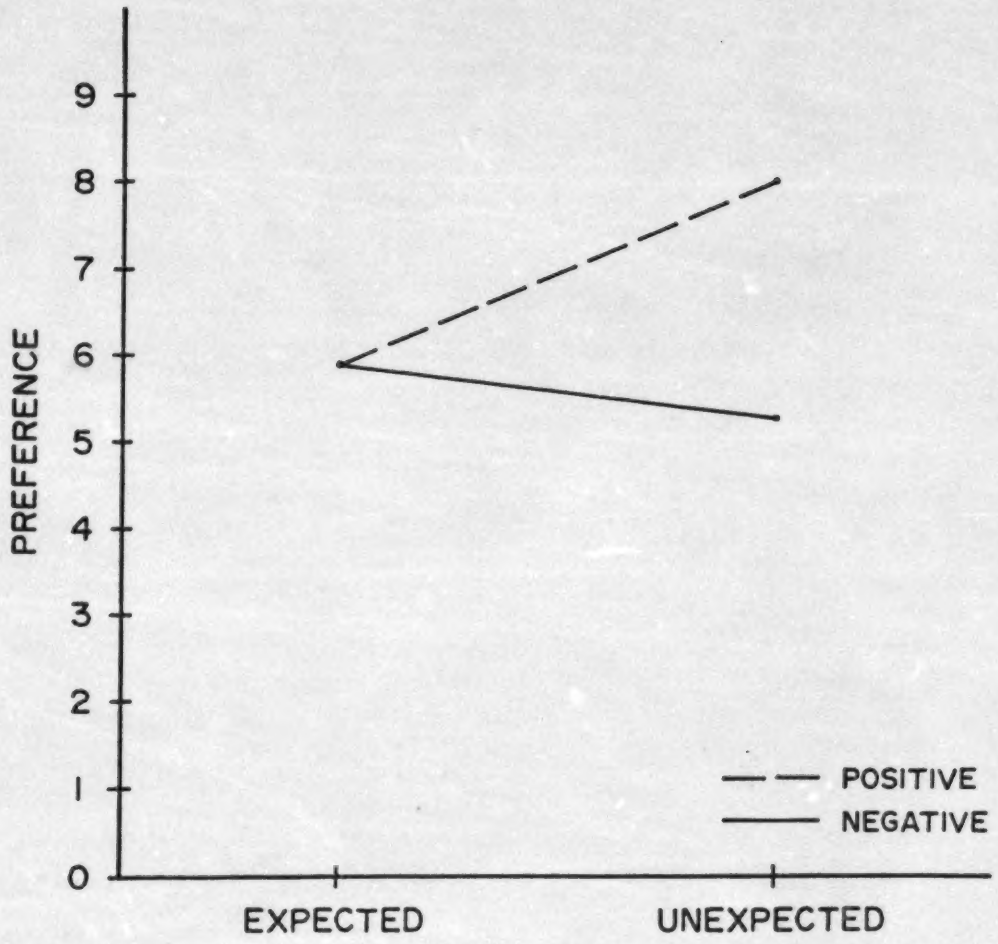
PREFERENCE
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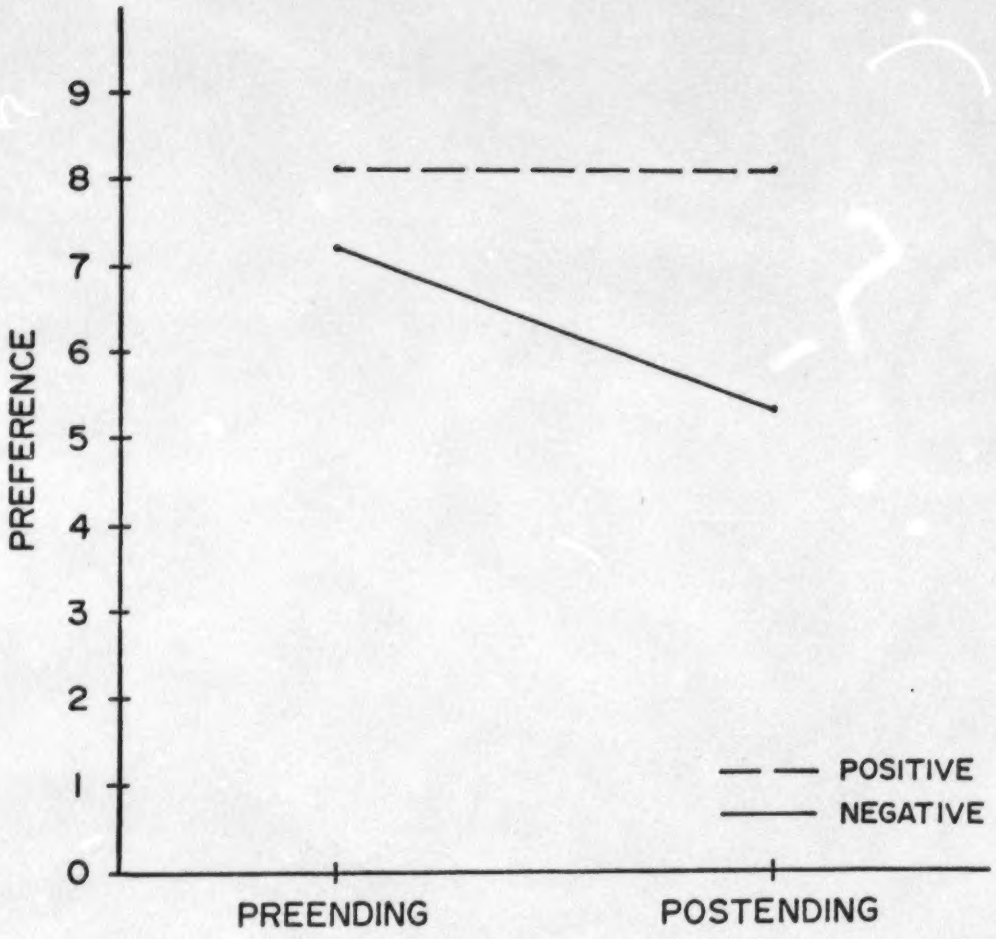
EXPECTED
UNEXPECTED


PREFERENCE
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4
3
2
1
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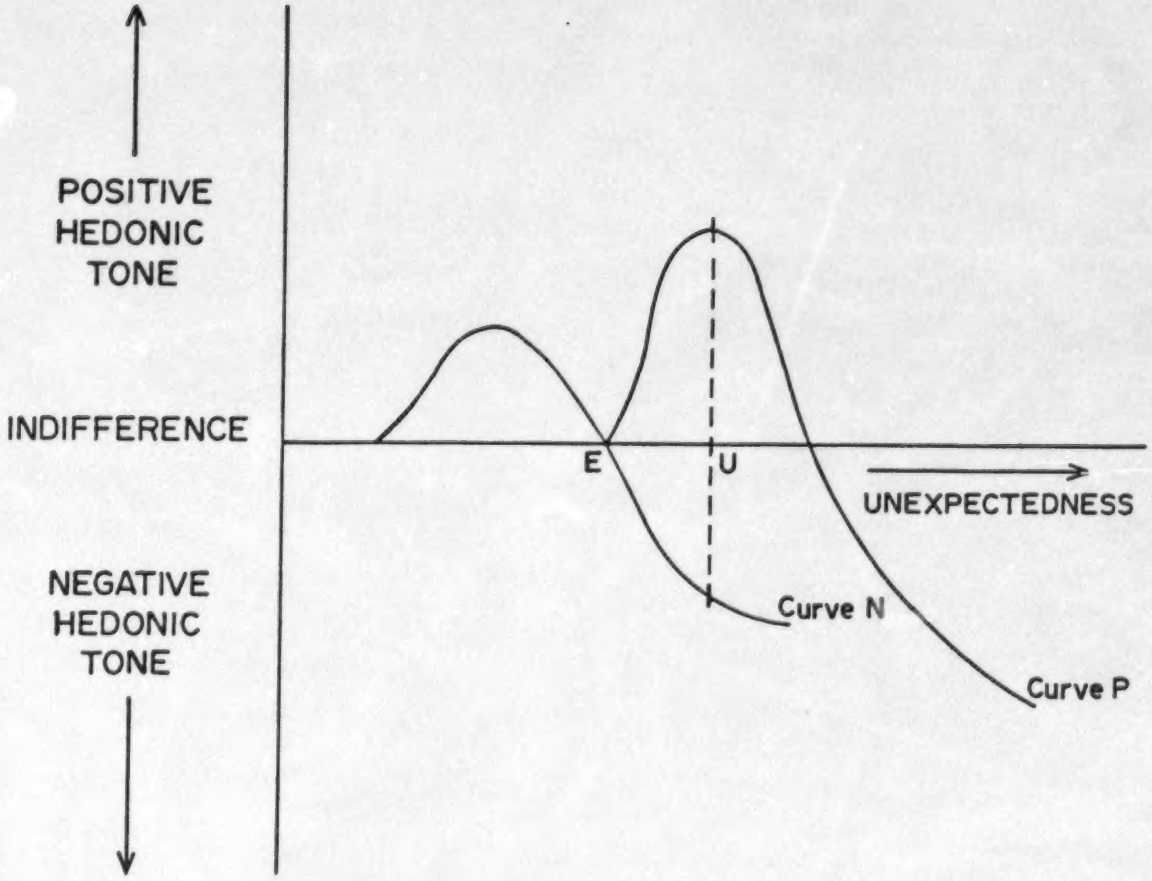
PREENDING
POSTENDING
POSITIVE
NEGATIVE


POSITIVE
HEDONIC
TONE
INDIFFERENCE
NEGATIVE
HEDONIC
TONE
E
U
UNEXPECTEDNESS
Curve N
Curve P